

# Geologic Hazards Information Resources at the Alaska Division of Geological & Geophysical Surveys (DGGS)

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Photo: Kawerak

# Outline

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- ◎ Current geologic hazards resources for ACMP planners
- ◎ Upcoming changes to hazards web site
- ◎ New hazards-mapping initiatives



# Currently Available Geologic Hazards Information Resources for ACMP Planners



Photo: J. Moore, B LM



# *“Guide to Geologic Hazards in Alaska”*

- ◎ Online scientific reference material on geologic hazards in Alaska published by DGGS (state) and USGS (federal)
- ◎ Developed ca. 2005 to help support ACMP consistency reviews for natural hazards
- ◎ Includes information of interest to general users

[www.dggs.dnr.state.ak.us/geohazards](http://www.dggs.dnr.state.ak.us/geohazards)

# Geologic hazards home page

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Department of Natural Resources  
Division of Geological & Geophysical Surveys

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## Guide to Geologic Hazards in Alaska - Introduction



Alaska is known for its wonderful diversity of natural landscapes. Unavoidably, however, the breathtaking scenery goes hand in hand with geologic processes that can be responsible for recurring and destructive hazards.

Alaska is particularly prone to both large and small magnitude geologic hazards due to its active and structurally complex geology, high relief, variable climate, and large coastal zones.

Effective [mitigation](#) of risks from catastrophic geologic hazards requires knowledge and understanding of local geology and geologic processes.

The pages and links below provide more information about many of the geologic hazards that are common in Alaska.

[Coastal and river issues](#)  
[Seismic hazards](#)  
[Radon](#)  
[Slope instability](#)  
[Weather fluctuations and climate change](#)  
[Volcanoes and volcanic hazards](#)


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    » Salt-water encroachment  
    » Sea level rise  
    » Storm surge  
    » Seiche  
    » Subsidence

Select  
“ACMP  
information”



# ACMP information home page

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## Guide to Geologic Hazards in Alaska - ACMP information



The [Alaska Coastal Management Program \(ACMP\)](#) provides stewardship for Alaska's coastal resources by coordinating coastal planning and project permitting.

A [statewide map \(1500 KB\) of coastal district boundaries](#) is accessible at the ACMP website. Natural hazards are described for each coastal district in the "Issues, Goals, and Objectives" and "Resource Inventory and Analysis" sections of the coastal district plans.

Each link below provides a listing of DGGS and USGS publications that contain hazard information that is pertinent to each coastal district.

- › [Aleutians East Borough Coastal District](#)
- › [Aleutians West CRSA Coastal District](#)
- › [Anchorage Municipality Coastal District](#)
- › [Bering Straits Coastal District](#)
- › [Bristol Bay Borough Coastal District](#)
- › [Bristol Bay CRSA Coastal District](#)
- › [Ceñaliulniit CRSA Coastal District](#)
- › [City and Borough of Juneau Coastal District](#)
- › [City and Borough of Sitka Coastal District](#)
- › [City and Borough of Yakutat Coastal District](#)
- › [City of Bethel Coastal District](#)
- › [City of Cordova Coastal District](#)
- › [City of Craig Coastal District](#)
- › [City of Hooper Coastal District](#)

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[Glossary](#)  
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Select your coastal  
district

# Publications list

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 **Geological & Geophysical Surveys**  
Alaska Department of Natural Resources

[State of Alaska](#) > [Natural Resources](#) > [DGGG](#) > [Publications](#) > [Bering Straits Coastal District](#)



## Bering Straits Coastal District Publications

Below is a list of publications related to Bering Straits Coastal District. Please click on the publication number link to access more detailed information and files for each publication.

Sort publication list by:


These icons indicate the available components of each publication:

-  = Report
-  = CD/DVD
-  = Maps
-  = Geospatial data


[AOF 125](#)    
Riehle, J.R., Emmel, K.S., and Bolm, J.G., 1981, Reconnaissance report on surficial geology of the coastal area from Tolstoi Point to Cape Nome, Norton Sound, Alaska: Alaska Division of Geological & Geophysical Surveys Alaska Open-File Report 125, 27 p., 3 sheets, scale 1:63,360.

[IC 38 ed. 1998](#)    
Nye, C.J., 1998, Volcanoes of Alaska: Alaska Division of Geological & Geophysical Surveys Information Circular 38 ed. 1998, 2 sheets, scale 1:4,000,000.


[IC 38](#)   
Nye, C.J., 1995, Volcanoes of Alaska: Alaska Division of Geological & Geophysical Surveys Information Circular 38, 2 sheets, scale 1:4,000,000.


[MP 98](#)   
Stevens, D.S.P., Reger, R.D., and Smith, R.L., 2003, Survey of geology, geologic materials, and geologic hazards in proposed access corridors in the Norton Bay Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys Miscellaneous Publication 98, 5 sheets, scale 1:250,000.

[MP 131](#)   
Cameron, C.E., Triplehorn, J.H., and Robar, C.L., 2003, Bibliography of information on Alaska volcanoes: Alaska Division of Geological & Geophysical Surveys Miscellaneous Publication 131, 1 DVD.

[OF 02-397](#)   
Waythomas, C.F., Miller, T.P., and Nye, C.J., 2002, Preliminary volcano-hazard assessment for Kanaga Volcano, Alaska: U.S. Geological Survey Open-File Report 02-397, 27 p.

[OF 2004-1033](#)   
McGimsey, R.G., Neal, C.A., and Girina, Olga, 2004, 1999 Volcanic activity in Alaska and Kamchatka: Summary of events and response of the Alaska Volcano Observatory: U.S. Geological Survey Open-File Report 2004-1033, 45 p.

[OF 2004-1034](#)   
Neal, C.A., McGimsey, R.G., and Chubarova, Olga, 2004, 2000 Volcanic activity in Alaska and Kamchatka: Summary of events and response of the Alaska Volcano Observatory: U.S. Geological Survey Open-File Report 2004-1034, 34 p.

[OF 2004-1453](#)   
McGimsey, R.G., Neal, C.A., and Girina, Olga, 2005, 2001 volcanic activity in Alaska and Kamchatka: summary of events and response of the Alaska Volcano Observatory: U.S. Geological Survey

Note types of  
information  
available

# Reference page



## Geological & Geophysical Surveys Alaska Department of Natural Resources

[State of Alaska](#) > [Natural Resources](#) > [DGGG](#) > [Publications](#) > [RI 96-7](#)

### RI 96-7

[Ordering Info](#)

**Title:** Geological and anthropological considerations in relocating Shishmaref, Alaska

**Authors:** Mason, O.K.

**Publication Year:** 1996

**Publishing Agency:** Alaska Division of Geological & Geophysical Surveys

**Total Price:** \$14.00

#### Bibliographic Reference

Mason, O.K., 1996, Geological and anthropological considerations in relocating Shishmaref, Alaska: Alaska Division of Geological & Geophysical Surveys Report of Investigation 96-7, 18 p., 1 sheet, scale 1:63,360.



#### Report Information

[Report](#), 18 p., .PDF format (1.5 M)



#### Maps & Other Oversized Sheets

[Sheet 1](#), Geologic map portions of the Shishmaref A-3, B-3 and Teller D-3 Quadrangles, Alaska, scale 1:63,360, .PDF format (6.8 M)  
Quadrangles: [Shishmaref](#), [Teller](#)

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#### GEOLOGICAL AND ANTHROPOLOGICAL CONSIDERATIONS IN RELOCATING SHISHMAREF, ALASKA

by  
Owen K. Mason<sup>1</sup>

ABSTRACT

The barrier-island village of Shishmaref, Alaska, is threatened by high-intensity storms that are occasionally ending the low dunes on which the village is built. The community has pursued several short-term solutions since the dunes were recognized in the 1950s. Relocation to the mainland appears to offer the best long-term solution. Aerial photograph interpretation and limited field research were conducted to assess alternative sites for village relocation. Three sites—also the mainland—were examined at the request of the City of Shishmaref for the short stages of the relocation. The several issues examined along the coast, and in the high bluff locality referred to as Hummock or Pine Mts, which is 1 mi (1.6 km) southwest of the present village on Shishmaref Island. Each of these sites presents serious engineering or access problems. Site-specific geotechnical studies are recommended to assess construction feasibility and design constraints. The past experience of coastal erosion and the subsidence needs of the community are important considerations for any relocation decisions.

#### INTRODUCTION

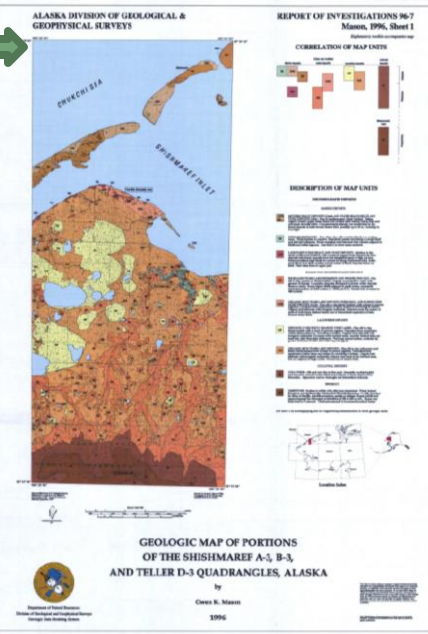
The island community of Shishmaref, on the northwest coast of Alaska (fig. 1), is annually threatened by storm surge and may face destruction by incremental bluff erosion, which may intensify if greenhouse effects cause sea level to rise. One response to the severe erosion problem involves relocating the village to the favored Peninsula mainland. In 1995 the Alaska Division of Geological & Geophysical Surveys received state funding to conduct a brief reconnaissance of the sedimentary characteristics and engineering properties of an area encompassing several possible relocation sites suggested by the City of Shishmaref. Some considerations of subsidence activities are included in the analysis.

#### GEOLOGIC AND GEOGRAPHIC BACKGROUND

##### GEOGRAPHIC SETTING: TIDAL RANGE AND STORM CLIMATOLOGY

Shishmaref is on Satchel Island in the central part of the southwest-northeast-oriented Shishmaref Barrier Island chain along the Chukchi Sea (fig. 1). The sandy Shishmaref barriers extend more than 60 mi (100 km) including several lagoons on northwest Seward Peninsula. Satchel Island, measuring 4.5 mi (7 km) by 1.2 mi (2 km), is the smallest of the barrier islands. Two tidal ridges define the north and south margins of the island and represent its most important attributes in terms of travel for subsistence purposes. The incremental effects of tides and storms have deposited a considerable amount of sand at the island margins. The resulting oversteepened tidal flats produce the dumb-bell-shaped bulges at the ends of Satchel Island. The southern half of the island is low-lying and marsh covered. Grass covered dunes transgress older marsh deposits and form a maximum of low dunes that slope to the northeast along the margin of the northern tidal flat. The highest dunes are 36 ft (8 m) above mean sea level. The cemetery and church site are at this highest elevation on the fourth dome landward (fig. 2). The island is underlain by 30 to 50 ft (9 to 15 m) of permafrost, the active layer is estimated at 1.5 to 2.5 ft (0.5 to 1.5 m) below the surface (Wheaton, 1980; Prosserovich and Nottingham, 1982, p. 4). The erosion and subsequent housing of buildings generally deposes the active layer, leading to the thawing of permafrost. In turn, the thawing of permafrost may foster erosion of the dunes (Prosserovich and Nottingham, 1982).

The southern Chukchi Sea is microtidal and ice covered for up to 9 months a year. Despite this, the Shishmaref barriers are a wave-dominated system, subject to the onslaught of storm waves during the open-water season, which starts in June or early July and can extend through November. Mean higher high water (MHHW), determined by using the elevation of wave-carried drift debris, is estimated at 3.5 to 3.8 ft (0.75 to 1.0 m) at Shishmaref (Prosserovich and Nottingham, 1982, p. 7). Prevailing coastal currents along the Shishmaref barriers are from southwest to northeast, the result of both geostrophic inflow from the Bering Sea and tidal currents (Madsen and Gardner, 1988). Temporary reversals in current direction occur under the influence of storms.



Note that maps  
and reports (text)  
are separate  
downloads





# Geological & Geophysical Surveys

## Alaska Department of Natural Resources

[State of Alaska](#) > [Natural Resources](#) > [DGGS](#) > [Publications](#) > [RI 94-24](#)

### RI 94-24

[Ordering Info](#)

**Title:** Geologic and derivative materials maps of the Anchorage C-7 NE Quadrangle, Alaska

**Authors:** Reger, R.D., Combellick, R.A., and Pinney, D.S.

**Publication Year:** 1994

**Publishing Agency:** Alaska Division of Geological & Geophysical Surveys

**Total Price:** \$20.50

#### Bibliographic Reference

Reger, R.D., Combellick, R.A., and Pinney, D.S., 1994, Geologic and derivative materials maps of the Anchorage C-7 NE Quadrangle, Alaska: Alaska Division of Geological & Geophysical Surveys Report of Investigation 94-24, 2 sheets, scale 1:25,000.



#### Maps & Other Oversized Sheets

[Sheet 1](#), Geologic map of the Anchorage C-7 NE Quadrangle, Alaska, scale 1:25,000, .PDF format (2.5 M)

Quadrangles: [Anchorage](#)

[Sheet 2](#), Derivative geologic-materials map of the Anchorage C-7 NE Quadrangle, Alaska, scale 1:25,000, .PDF format (1.5 M)

Quadrangles: [Anchorage](#)



#### Digital Geospatial Data

##### Dataset #1: Anchorage C-7 NE Derivative materials [Metadata](#)

File Name	Data File Format	Download	File Size	Info
anc_c7ne_materials	Vector data shape files	<a href="#">Download</a>	295.9 K	<a href="#">Read me</a>

##### Dataset #2: Anchorage C-7 NE Geology [Metadata](#)

File Name	Data File Format	Download	File Size	Info
anc_c7ne_geology	Vector data shape files	<a href="#">Download</a>	487.5 K	<a href="#">Read me</a>

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For some, digital  
data links



# Upcoming Changes to Hazards Web Site

309 Enhancement  
Grant



Photo: DGGs



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### Guide to Geologic Hazards in Alaska - Introduction



Alaska is known for its wonderful diversity of natural landscapes. Unavoidably, however, the breathtaking scenery goes hand in hand with geologic processes that can be responsible for recurring and destructive hazards.

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- [Glossary](#)
- [Hazards by category](#)
- [Maps and publications](#)

Alaska is particularly prone to both large and small magnitude geologic hazards due to its active and structurally complex geology, high relief, variable climate, and large coastal zones.

Effective [mitigation](#) of risks from catastrophic geologic hazards requires knowledge and understanding of local geology and geologic processes.

Mockup of  
new  
geologic  
hazards  
home page

• Structure and  
organization  
are streamlined  
and simplified

• ACMP will  
have its own  
simple, direct  
url (address  
pending)





Mockup of new “hazards by category” page

Additional links to:

- Glossary
- Maps and publications

- Significant work planned for map-based interface...

Map Index - Results Interface - Windows Internet Explorer

http://maps.akgeology.info/STSE/stse

Live Search

File Edit View Favorites Tools Help

Convert Select

Map Index - Results Interface

Page Tools

# Alaska Geologic Map Index Search

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Recenter ?

Zoom In ?

Zoom Out ?

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Full Extents ?

Point Search ?

Rectangle Search ?

Clear Selections ?

Clear Highlight ?

New Search Criteria ?

Return to Home

New Search Criteria ?

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## Search Results

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ExpressView

Tool: Recenter

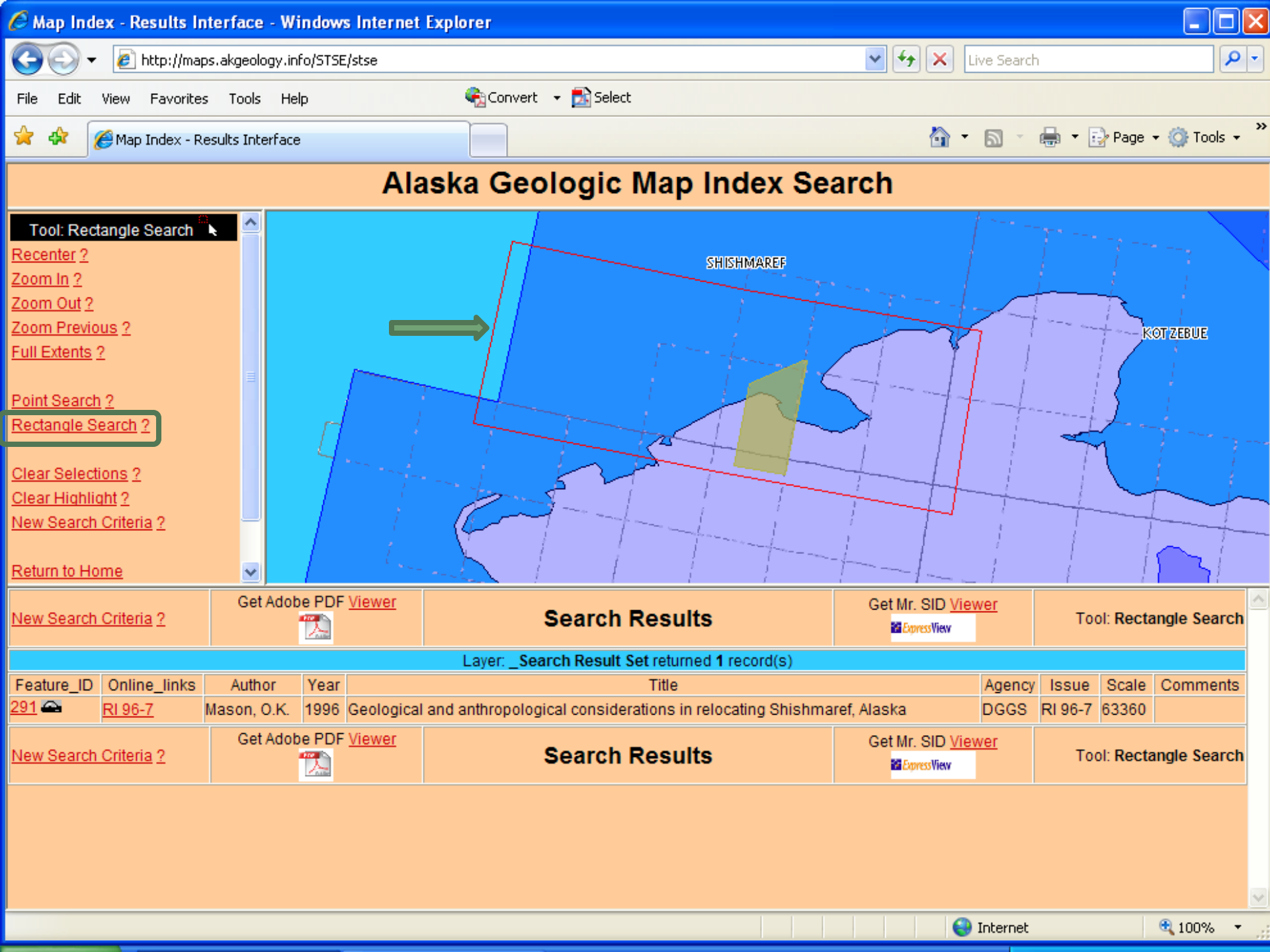
Layer: \_ Search Result Set returned 292 record(s)

Feature_ID	Online_links	Author	Year	Title	Agency	Issue	Scale	Comments
<a href="#">108</a>	<a href="#">GR 33</a>	Asher, R.R.	1969	Geological and geochemical study, Solomon C-5 Quadrangle, Seward Peninsula, Alaska	DGGS	GR 33	63360	
<a href="#">23</a>	<a href="#">AOF 140</a>	Kline, J.T.	1981	Surficial geology of lower Pilgrim Valley and vicinity, western Seward Peninsula, Alaska	DGGS	AOF 140	24000	
<a href="#">87</a>	<a href="#">GR 11</a>	Herreid, G.H.	1965	Geology of the Omilak-Otter Creek area, Bendeleben Quadrangle, Seward Peninsula, Alaska	DGGS	GR 11	63360	
<a href="#">88</a>	<a href="#">GR 23</a>	Herreid, G.H.	1966	Geology and geochemistry of the Inmachuk River map area, Seward Peninsula, Alaska	DGGS	GR 23	63360	
<a href="#">90</a>	<a href="#">SR 34</a>	Robinson, M.S., and Stevens, D.L.	1984	Geologic map of the Seward Peninsula	DGGS	SR 34	500000	

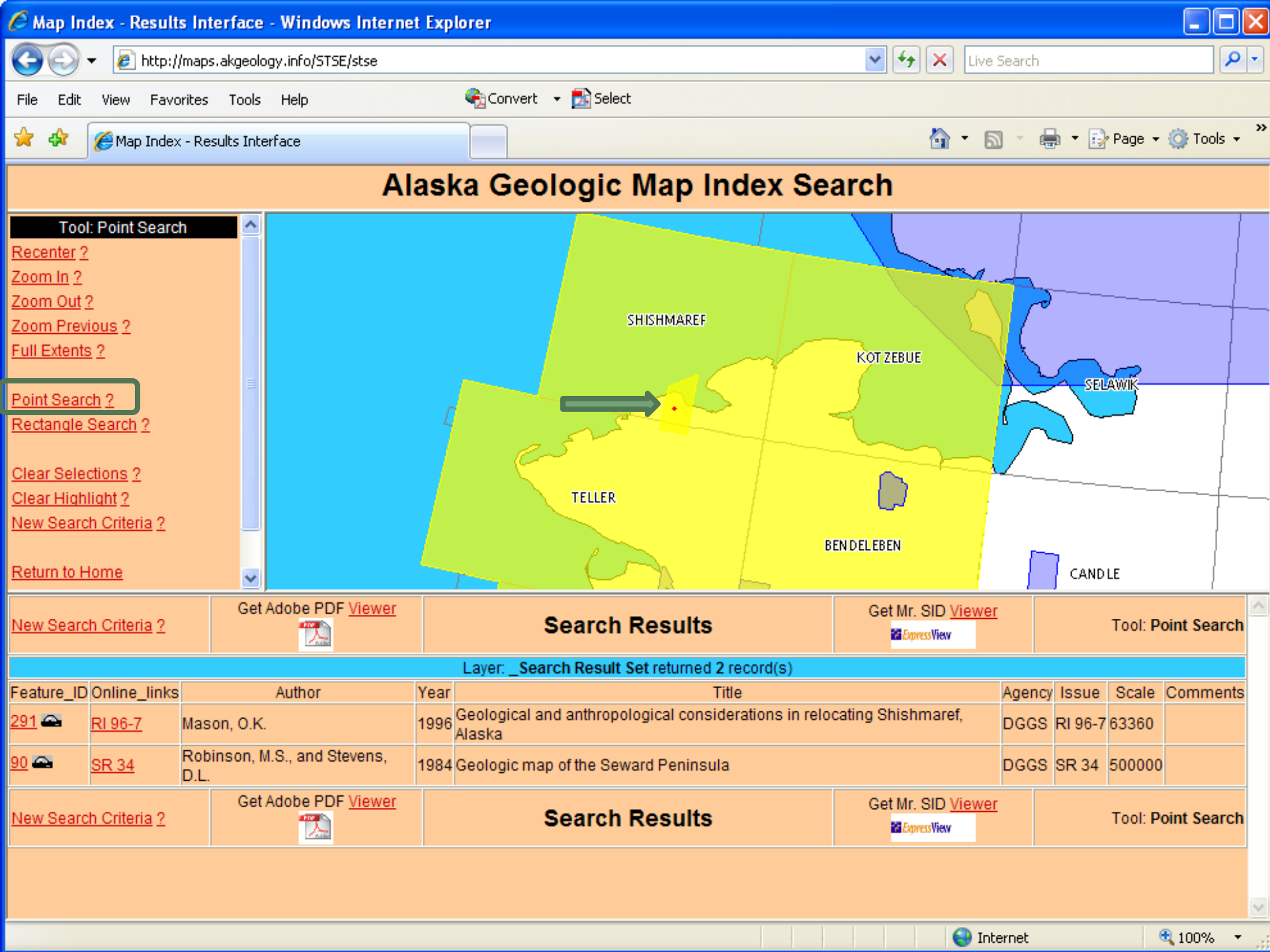
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# New DGGS Hazards-Mapping Initiatives

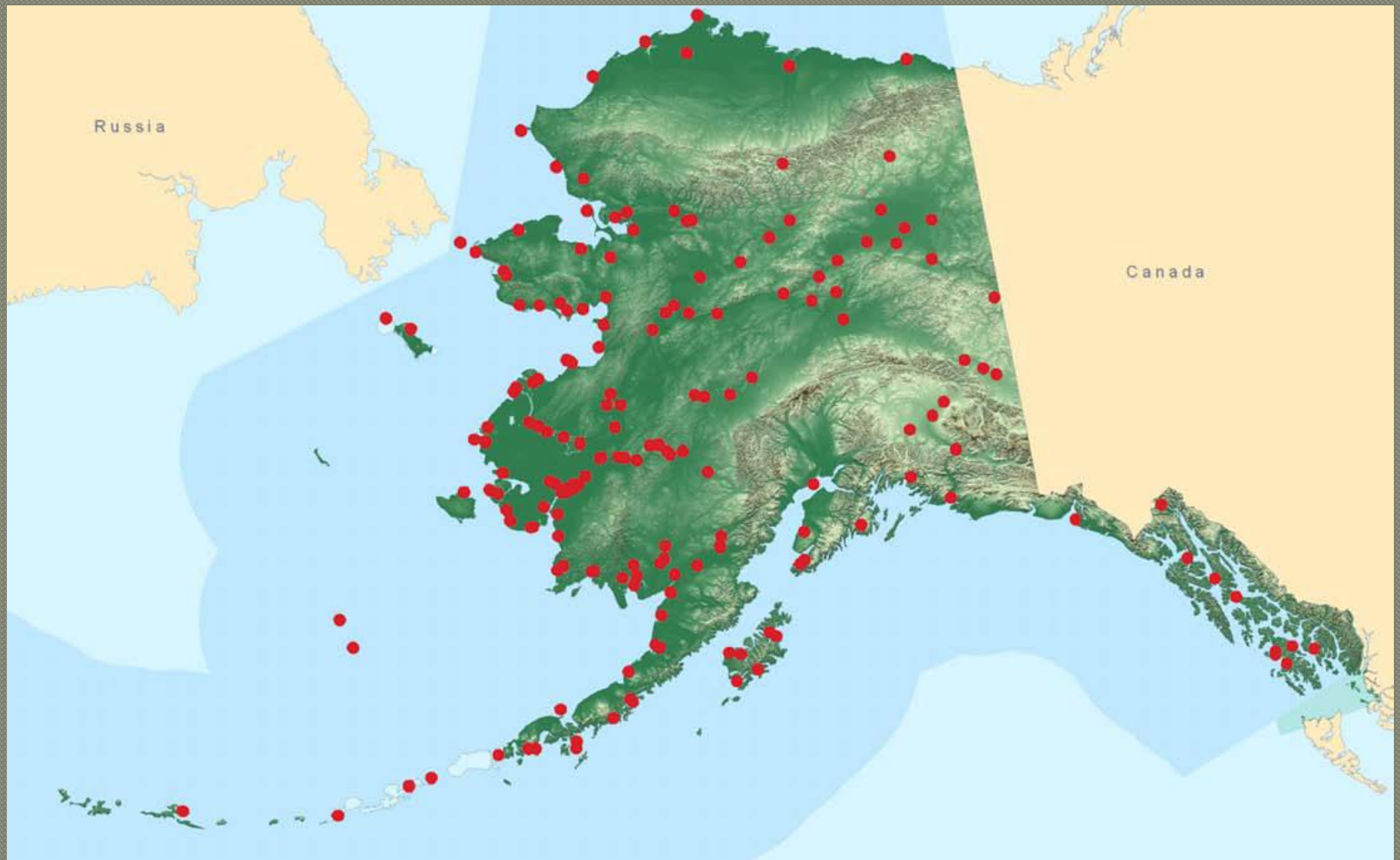
State CIP  
Federal CIAP  
Federal STATEMAP



Funding for up to  
~15 communities  
over the next 4 years

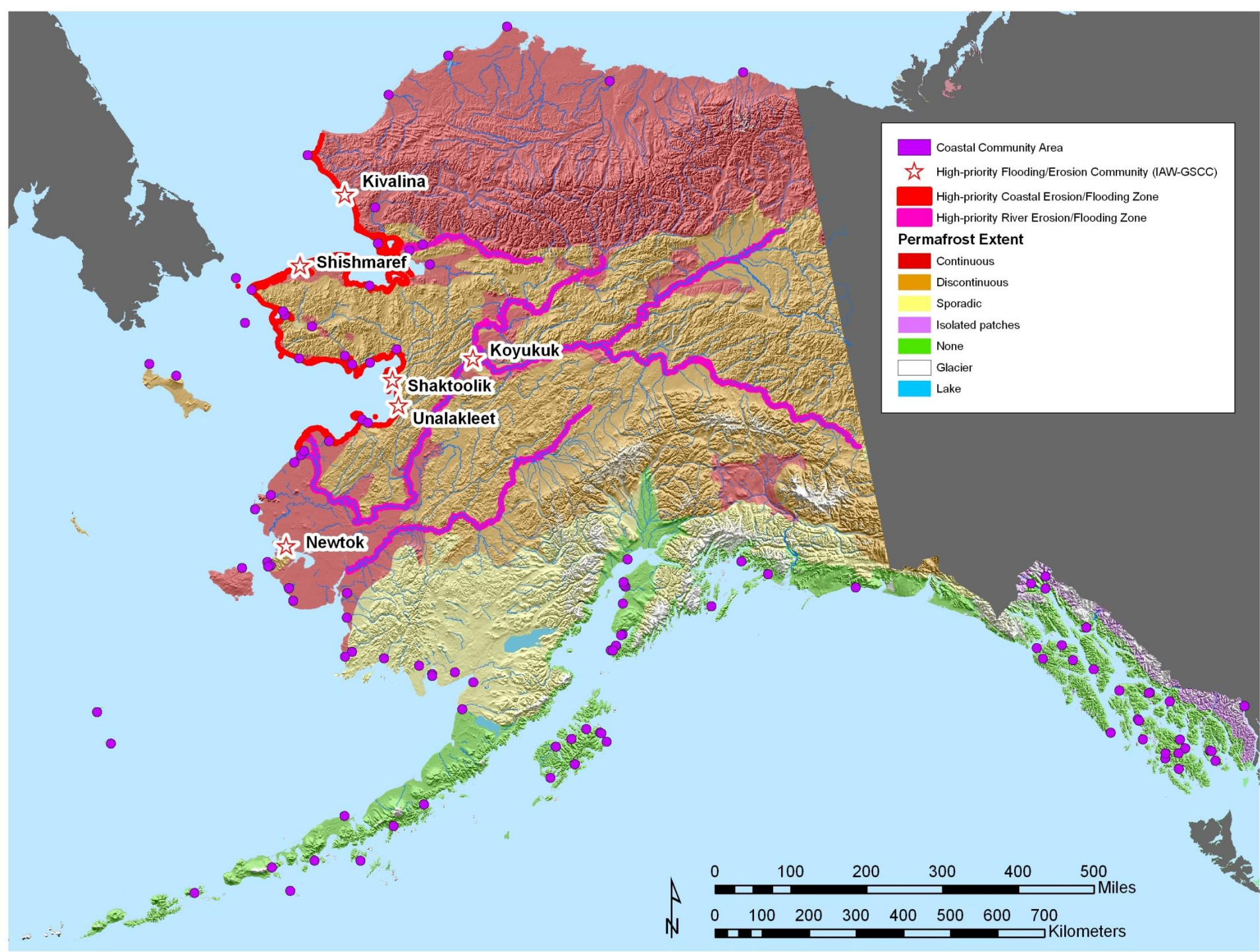


Photo: DOT&PF



Flooding and erosion affects 184 out of 213, or 86 percent, of Alaska Native villages to some extent (US Government Accounting Office Report GAO-04-895T).

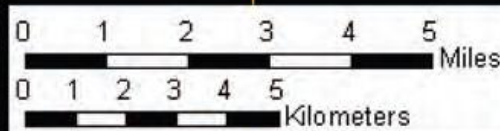






# Kivalina

## 2010 STATEMAP Project



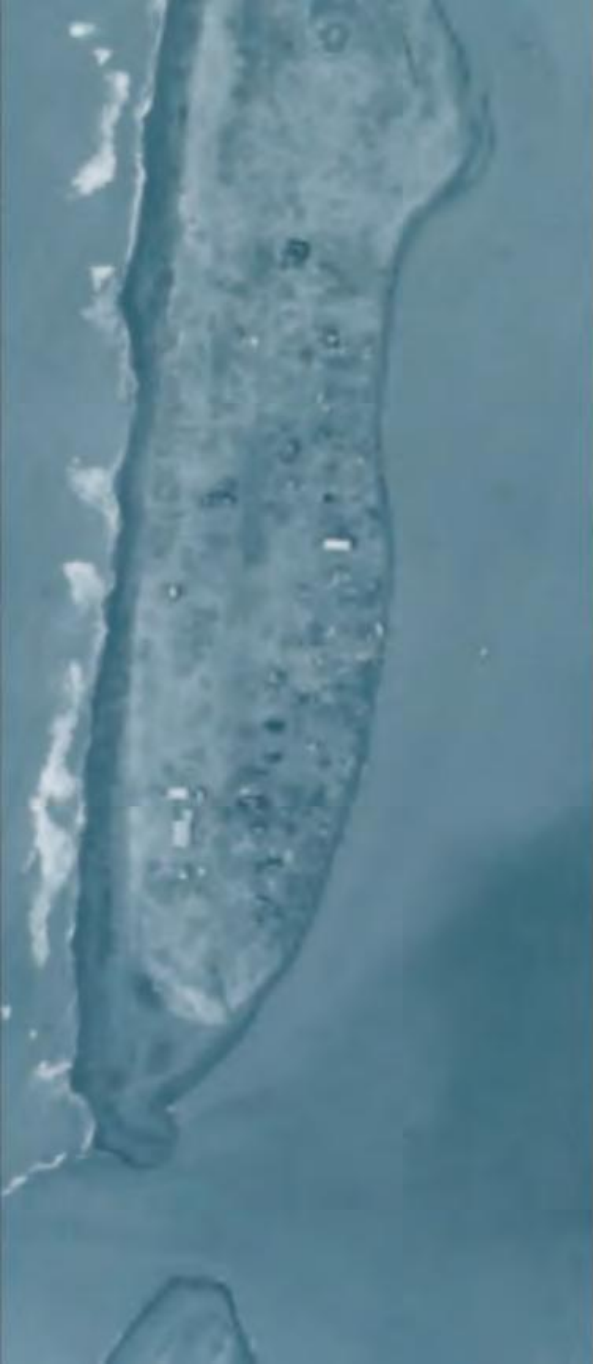
Kivalina

NOATAK C-5

NOATAK D-6

NOATAK D-5





1966



2000



2007

Kivalina is  
just the first  
of many.

Where  
next?





Questions?

[www.dggs.dnr.state.ak.us/geohazards](http://www.dggs.dnr.state.ak.us/geohazards)